

Remarks:

Reconsideration of the application is respectfully requested.

Claims 1 - 15 are presently pending in the application. As it is believed that the claims were patentable over the cited art in their original form, the claims have not been amended to overcome the references.

In item 2 of the above-identified Office Action, claims 1 - 15 were rejected under 35 U.S.C. § 103(a) as allegedly being obvious over U. S. Patent No. 5,942,374 to Smayling ("SMAYLING") in view of Japanese Patent No. 09-083040 to Aomori et al ("AOMORI"), further in view of U. S. Patent No. 5,811,358 to Tseng et al ("TSENG").

Applicants respectfully traverse the above rejections.

More particularly, claim 1 recites, among other limitations:

irreversibly fixing the activatable doping substance in the organic compound in regions that adjoin a source contact and a drain contact as a result of exposing the organic compound with the activation radiation;

removing unbounded doping substance at reduced pressure or elevated temperature from the organic compound after the exposure; [emphasis added by Applicants]

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Similarly, Applicants' claim 9 recites, among other limitations:

introducing a doping substance activated by exposure with an activation radiation into the organic semiconductor;

after the exposure, removing unbounded doping substance at reduced pressure or elevated temperature from the organic semiconductor to irreversibly fix, in regions of the organic semiconductor adjoining the source contact and the drain contact, the doping substance in the organic semiconductor and to obtain contact regions adjoining the source contact and the drain contact, . . .; [emphasis added by Applicants]

As such, Applicants' independent claims require, among other things: 1) introducing a doping substance activated by exposure with an activation radiation into an organic semiconductor; and 2) after the exposure, removing unbounded doping substance. However, the cited references fail to teach or suggest these limitations of Applicants' claims, among others.

More particularly, page 2 if the Office Action alleged that the **SMAILING** disclosed a method of doping an organic conductive layer wherein a substrate is coated with a polyimide, and doped with a dopant gas, followed by exposure through a mask to radiation so as to form a doped region, wherein the remaining portion (less doped, residual dopant) of the mask layer (polyimide or PR) is removed. See also, for

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example, the allegations made on pages 5 and 6 of the Office Action, which state, in part:

Smayling teaches doping a polyimide layer selectively (see col. 10, lines 1-17) and the unbound doping substance present atop the organic compound (i.e. the polyimide layer) is removed i.e., reference 58, of figure 13, is the portion that contains unbound doping substance, and is removed after the irradiation process. [emphasis added by Applicants]

Applicants respectfully disagree. Col. 10 of **SMAYLING**, lines 1 - 17, do not disclose the removal of unbounded doping substance, as required by Applicants claims. This can be seen from col. 10 of **SMAYLING**, lines 1 - 17, which state:

For example, as illustrated in FIG. 12, p- and n-regions are formed in neutral polyimide 52. FIG. 13 illustrates how each of the regions can be formed. First a mask layer 58, which may be a low temperature CVD oxide such as silicon dioxide for example, is deposited over the neutral polyimide layer 52. Next, the mask layer 58 is patterned and etched with a photoresist (not shown). For an oxide mask layer 58, plasma etching may be used. The etching step exposes a first exposed first region 54. After etching and before doping the photoresist (not shown) is removed. The first region 54 is then exposed to dopant gas such as diborane to establish a p- region 54. Next, the remaining portion of the mask layer 58 is removed. For example, the oxide can be removed by HF. The sequence beginning with oxide deposition and ending with oxide removal is then repeated for the second well region 56. For an n-doped region 58, the dopant gas can be phosphene or arsene. [emphasis added by Applicants]

As such, in **SMAYLING**, the reference numeral 58, as used in the last line of the above quotation, is erroneous. Rather, in **SMAYLING**, the reference numeral 58 references a mask layer,

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and not an n-doped region. As can be seen from Figs. 12 and 14 of **SMAYLING**, as well as col. 10 of **SMAYLING**, line 28, the n-doped region of **SMAYLING** is labeled by the reference numeral 56. Thus, col. 10, lines 16 - 17 of **SMAYLING** should read, "For an n-doped region [56] the dopant gas can be phosphene or arsene". Thus, in **SMAYLING**, it is a mask layer 58 that is removed, and not an unbounded doping substance, as required by Applicants' claims.

In other words, in **SMAYLING**, the mask layer 58 is removed, but the mask layer 58 of SMAYLING is not a doping substance.

Rather, in **SMAYLING**, the dopant is applied to the first exposed region 54 of the polyimide layer 52. However, **SMAYLING** does not teach or suggest anywhere in that reference that the dopant applied to the first exposed region 54 is removed.

Additionally, Applicants' independent claims 1 and 9 make clear that the unbound dopant is removed from the organic semiconductor compound. As such, Applicants' claims require that the organic semiconductor compound contains both bound and unbound dopant substances, and the unbound dopant substances in the organic semiconductor compound are what is being removed. This can be seen, for example, from claim 1, which states, in part:

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removing unbounded doping substance at reduced pressure or elevated temperature from the organic compound after the exposure;

See also, for example, Applicants' claim 9, which states, in part:

after the exposure, removing unbounded doping substance at reduced pressure or elevated temperature from the organic semiconductor . . .

However, if the Office Action is alleging that a dopant substance is contained in the mask layer 58 of **SMAILING**, such that removal of the mask layer 58 of **SMAILING** results in removal of a dopant substance, this interpretation still fails to teach or suggest the removal of an unbounded doping substance from the organic semiconductor, as required by Applicants' claims. Rather, **SMAILING** still fails to teach or suggest, among other limitations of Applicants' claims, removing an unbound dopant substance from an organic layer, since any dopant substance in the mask layer 58 is prevented from being introduced into the polyimide layer 52 by the mask layer 58 of **SMAILING**, itself. Furthermore, the mask layer 58 of **SMAILING** is made of an inorganic material, such as silicon dioxide. See, for example, col. 10 of **SMAILING**, lines 3 - 6. As such, the mask layer 58 of **SMAILING** cannot be characterized as the electrically conductive organic compound of the present

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claim 1, or the organic compound of the present claim 9, into which a dopant is introduced.

For the foregoing reasons, among others, it can be seen that **SMAILING** does not teach or suggest removing unbound doping substances from an organic compound after the irradiation process, as is alleged on pages 5 and 6 of the Office Action. Further, Applicants respectfully disagree with the statement made on page 6 of the Office Action alleging that the **TSENG** reference discloses "the removal of unbound doping substance at elevated temperatures".

More particularly, the **TSENG** reference, cited in the Office Action in combination with **SMAILING**, also fails to teach or suggest, among other limitations of Applicants' claims, removing unbounded doping substance at reduced pressure or elevated temperature from the organic compound after the exposure. With regard to the rejection of Applicants' claims, page 4 of the Office Action alleged, in part:

Tseng, in col 2, lines 65 - 67, in col. 3, lines 1 - 3, and in col. 4, lines 10 - 14, discloses that **the remaining part of the implant-hardened photo resist is removed via stripping at elevated temperatures.**
[emphasis added by Applicants]

However, photoresist is not an unbounded doping substance in an organic compound. Applicants respectfully disagree that

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the **TSENG** reference teaches or suggests, among other limitations of Applicants' claims, the removal of **unbounded doping substance** at elevated temperatures, as alleged on page 6 of the Office Action.

More particularly, **TSENG** discloses the stripping of a bulk-body of **a photoresist** from a semiconductor device at a temperature of above 220° C. See, for example, the Abstract of **TSENG** and step 2 of Fig. 2 of **TSENG**. However, as clearly set forth in **TSENG**, the above 220° C is for the removal of **photoresist**, and not for the removal of unbound doping substance from an organic compound, as required by Applicants' claims. This failure of **TSENG** can also be seen, for example in col. 2 of **TSENG**, lines 1 - 3, which state:

This is the most recent technique for photoresist removal and uses plasma oxidation (commonly called plasma ashing). [emphasis added by Applicants]

See also, for example, col. 2 of **TSENG**, lines 12 - 15, which state:

In order to more effectively remove the photoresist after ion implantation, a high temperature (>200° C.) dry ashing method is carried out to strip the photoresist. [emphasis added by Applicants]

Further, see, for example, col. 4 of **TSENG**, lines 10 - 14, cited in the Office Action, which state:

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The second step is to remove the bulk of the photoresist body at a higher temperature for better efficiency. The subsurface of the photoresist is stripped by the same oxygen and small amount of nitrogen/hydrogen plasma at a temperature above 220° C. [emphasis added by Applicants]

There is a clear technical difference between removing unbounded doping substances at reduced pressure or elevated temperature from an electrically conductive organic compound, as claimed by Applicants, and the nearly complete removal of a photoresist layer, as disclosed in TSENG. Rather, according to the present invention, a doping substance is first introduced and irreversibly fixed into the electrically conductive organic compound. Subsequently, in Applicants' claimed invention, any unbounded doping substance is removed. However, in the context of Applicants' claimed invention, this means that the electrically conductive compound remains as it is, and only the unbounded doping substance is removed therefrom. In contrast to Applicants' claimed invention, TSENG clearly teaches almost completely removing a photoresist layer, which is not a electrically conductive organic compound. As such, TSENG clearly teaches away from Applicants' presently claimed invention because, according to the present invention, it is necessary that the electrically conductive compound remains unchanged.

Further, the TSENG reference does not teach or suggest, among

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other limitations of Applicants' claims, that unbounded doping substances are removed from an organic compound. Rather, **TSENG** only discloses the complete removal of a photoresist layer, which is completely different from Applicants' claimed invention requiring, among other things, the removal of doping substances present in a organic/electrically conductive layer.

Applicants note that the **TSENG** reference does disclose doping with impurities. However, this portion of **TSENG** only applies to the S/D regions 9 of **TSENG**, and not to the removed photoresist layer of **TSENG**. See, for example, col. 3 of **TSENG**, lines 52 - 55.

From the foregoing, it can be seen that the **SMAYLING** and **TSENG** references fail to teach or suggest, among other limitations of Applicants' claims, removing unbounded doping substance at reduced pressure or elevated temperature from the organic compound after the exposure, as required by Applicants' claims. The **AOMORI** reference, cited in the Office Action in combination with **SMAYLING** and **TSENG**, does not cure the above-discussed deficiencies of the **SMAYLING** and **TSENG** references.

For the foregoing reasons, among others, Applicants' claims are believed to be patentable over the **SMAYLING**, **TSENG** and **AOMORI** references, whether taken alone, or in combination.

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It is accordingly believed that none of the references, whether taken alone or in any combination, teach or suggest the features of claims 1 and 9. Claims 1 and 9 are, therefore, believed to be patentable over the art. The dependent claims are believed to be patentable as well because they all are ultimately dependent on claims 1 or 9.

In view of the foregoing, reconsideration and allowance of claims 1 - 15 are solicited.

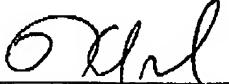
In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate receiving a telephone call so that, if possible, patentable language can be worked out.

If an extension of time for this paper is required, petition for extension is herewith made.

Please charge any fees that might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner Greenberg Stemer LLP, No. 12-1099.

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